Evidence of long distance dispersal in the Common shrew *(Sorex araneus)*

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Dispersal is an important component in the dynamics of small mammal populations (Krebs 1979; Gaines and McClenaghan 1980) and plays an important role in gene flow (Gaines 1981; Slatkin 1985; Barton 1987). Most of our knowledge concerning dispersal derives from continuous or pulsed removal of individuals from sampling areas contiguous with undisturbed areas of similar habitats. Other studies on animal dispersal rely on drift fences with continuous trapping of individuals moving away from the areas under study. Such studies often have indicated a limited number of dispersers (Verner and Getz 1985) and inflow of nearby residents to removal areas (Baird and Birney 1982).

Radiotracking of voles (McShea and Madison 1987) has disclosed only rare instances of dispersal. In general, there is a paucity of concrete observations of long distance dispersers. Here we report evidence of long distance dispersal in common shrews *(Sorex araneus)*.

Numerous tracks of small mammals were observed on the snow-covered ice of the lake Ekoln (see figure) in south-central Sweden during one week in February, 1986. The snow was 2–5 cm deep giving a clear imprint of the tracks. During the study period night time temperatures were between −5 °C and −15 °C and the day time temperature between −5 °C and +2 °C. The tracks were made by woodmice (*Apodemus* spp.) and shrews *(Sorex araneus)*. Several tracks on the snow were followed and plotted on maps.

Along a 5 km segment of the eastern shore, we found tracks of eight common shrews *(Sorex araneus)*, which had set out from the shore and then turned back again. All these individuals had moved 0.3–0.4 km out on the ice before turning back.

In two instances common shrews succeeded in crossing a 1 km wide bay (tracks A in the figure). Their tracks led directly away from the shore with no detours, and the animals burrowed under the snow when reaching the opposite shore. Another shrew moved 3 km (track B in the figure), making several detours after about 1.5 km. This shrew was found dead 0.5 km from the opposite shore. It was an immature female, weighed 5.1 g, and exhibited no abnormalities. The mean January-February weight ($\bar{x} \pm SD$) of snap-trapped female common shrews in this area was 6.1 ± 0.6 g (n = 24).

Another common shrew (C in the figure) travelled in the opposite direction to the previous one. This animal also made several detours roughly halfway between the shores but succeeded in reaching the opposite shore after 4 km of running on the snow-covered ice. It made some 50–60000 footprints during this trip.

Calculated distances for tracks B and C are minimum distances. If all small detours and deviations from a straight line are included the figures should be increased by 10 to 20 %, giving distances of 3.3–3.6 km and 4.4–4.8 km for tracks B and C, respectively.

These observations of dispersal distances of 3–5 km in the common shrew demonstrate movements more than one order of magnitude larger than the normal home ranges of these

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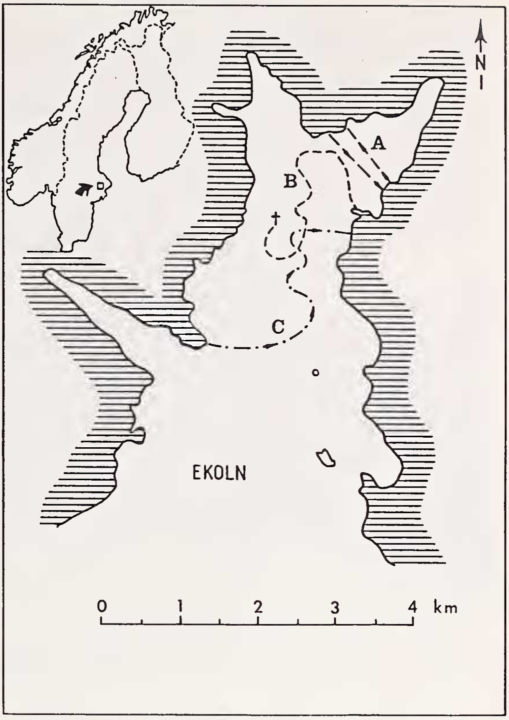
animals: SHILLITO (1963) found immatures generally to remain within a small area (average length 37 m) but some moved more widely (119 m recorded). Breeding animals had larger ranges (at least 144 m recorded). MICHIELSEN (1966) observed some animals to move at least 250–350 m. By successive trapping she once found a shrew that covered a distance of 800 m in a few weeks. However, movements in the range of one to two km in exposed environments may be a typical behaviour even at subzero temperatures. Considerably longer trips on lakes may be accidental and non-adaptive as illustrated by the dead shrew found after a dispersal distance of 3–4 km. Still, as demonstrated by track C, even mammals as small as a common shrew are capable of crossing an exposed strip 4–5 km wide.



Map of the northern part of lake Ekoln with tracks of *Sorex araneus* (A–C) observed during a week in February 1986

One *Apodemus* sp. (probably *A. sylvaticus*) moved almost one km on the ice of lake Ekoln. Other authors (e.g. LOMOLINO 1984 and references therein) have observed movement distances of small rodents extending from a few m to some 2 km on ice. However, the dispersal by *S. araneus* reported here is of at least the same order as the longest distance that seems recorded when radio-tracking a small mammal, viz. 3.3 km representing a ten day return journey of a rat *(Rattus norvegicus)* (TAYLOR and QUY 1978).

Studies of island populations of the vole *Microtus agrestis* (POKKI 1981) have demonstrated regular dispersal between islands by swimming. A similar summer dispersal by swimming seems to occur in *S. araneus* (HANSKI 1986). Such studies of dispersal between islands and across lakes represent movements in environments that are extreme for small terrestrial mammals. In terrestrial landscapes dispersal between various habitats should be easier. Extensive movements of voles in natural habitats have been demonstrated by MYLLYMÄKI (1970) and HANSSON (1977). Taken together these observations imply that long distance dispersal, and thus the possibility of gene flow, may affect the population dynamics of small mammals in even seemingly isolated habitats and that a frozen body of water is no barrier for gene flow.

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A rare nipple anomaly in Ringtails, *Bassariscus astutus* (Procyonidae)

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Ringtails typically have 4 mammae and 1 to 4 young per litter (Poglayen-Neuwall and Toweill, in press). Burt and Grossenheider (1960) reported 6 mammae, Cahalane (1947) and Lechleitner (1969) litters of up to 5 young. None of these authors indicated the source of his information. Toweill (pers. comm.) mentioned his pet ringtail *(Bassariscus astutus flavus)* having had 5 nipples, the supernumerary probably being non-functional.

On 25 May 1986 we trapped a female *Bassariscus astutus arizonensis* in a canyon in the Santa Rita Mountains of southern Arizona. This animal had 5 prominent mammae with well developed nipples, which appeared barely suckled; the vulva was conspicuously inflated indicating very recent parturition. We had neither measuring tools nor camera with us, therefore released the animal immediately.

On 7 June we returned to carry out another trapping operation. We recaptured this

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